

CLAIMS

We claim:

1. A method for securing a computer system, characterised by:
 - a) Augmenting selected memory items by Memory Item Headers (MIH)
 - b) Replacing traditional pointers to the selected memory items by Pointers to Intermediary Pointer Objects (PIPOs)
 - c) Validating references made to the memory items through the PIPOs at run-time
2. A method in accordance with claim 1, wherein said selected memory items can include functions, arrays, objects, fundamentals and other program constructs that can be referenced through a traditional pointer
3. A method in accordance with claims 1 and 2, wherein the Memory Item Headers (MIH) include information about the original memory item; said information to include at least the length of the original memory item or a biased version thereof and optionally additional information including:
 - a) Type information
 - b) Access rights
 - c) Reference counts
 - d) Object IDs
4. A method in accordance with any of the previous claims, wherein the Pointers to Intermediary Pointer Objects hold a reference to a newly disclosed Intermediary Pointer Object (IPO); said Intermediary Pointer Object having at least two parts:
 - a) A reference to a memory item's header (MIH)
 - b) An offset to a location in the memory item
5. A method according to claim 4 wherein said offset is with regard to the start of the original memory item or the start of its MIH
6. A method according to any of the previous claims wherein said Pointers to Intermediary Pointer Objects assume an IPO offset of zero and reference a MIH directly

7. A method according to any of the previous claims wherein said references have the same form as traditional pointers
8. A method according to any of the previous claims wherein said validating is characterised by checking that attempts to reference a memory item through a PIPO are consistent with the information held in the corresponding MIH and IPO
9. A method according to claim 8 wherein said consistency checking can include any of:
 - a) Bounds checking
 - b) Type checking
 - c) Access checking
 - d) Reference count checking
10. A method according to claim 9 wherein said bounds checking is further characterised by lower and upper bounds checking that may be applied together or independently
11. A method according to any of the previous claims wherein said validating is performed by instrumentation implemented in either:
 - a) Software or
 - b) Hardware
12. A method according to claim 11 wherein, said hardware instrumentation is implemented in the CPU of a computer system as new instructions or in modifications to the microcode for existing instructions
13. A method in accordance with any of the previous claims wherein run-time PIPOs are distinguished from traditional pointers by: registers reserved for PIPOs, memory areas reserved for IPOs, tags, maps, new CPU instructions or new address modes
14. A method according to any of the previous claims implemented as modifications to a compilation process, run-time libraries, functions, in-line macros, system calls, source translation or other means
15. A method or apparatus substantially as described herein
16. Apparatus configured or adapted to perform any one of the methods of the previous claims